Title:
Integrated Pest Management for Organic Field Corn Producers

Project Leader(s):
Kevin H. Ganoe**,** Central New York Dairy & Field Crops Team Area Extension Educator

Abstract:
Organic corn producers work under a different set of constraints due to the standards set by the USDA and their local organic certifying agency to be certified organic. The information and experience base for organic production is considerably smaller than that for conventional corn production. Four farms participated in a project to look at pest management concerns for organic corn producers. Fields on these farms were scouted on a weekly basis during the summer of 2006 for insect, disease and weed pests. Weed control was affected to a large degree by cultivation, previous weed problems and crop rotation. Early and more frequent cultivation and corn planted in fields that have been hay for many years appear to reduce weed problems. However long-term grass hay fields planted to corn may be more problematic as insect pests such as grubs and wireworms are more likely to be present.

Background and justification:
Field corn can be an important crop in the crop rotation for organic farmers because of its limited supply and greater demand. Just because corn is grown organically does not mean any less management may be needed, if anything more may be required. This is one of the reasons that some organic dairies have chosen not to grow corn.

Organic regulations on rotations, fertilizers and pesticides frame the cropping practices and what the potential pest problems may exist. For example good weed control is often listed by organic field corn producers as being very difficult to achieve because of the demanding schedule of cultivation. Yet an insect like corn rootworm should never be a pest because continuous corn is not allowed; corn may only be grown for one year. Planter box treatments are not allowed so there is greater potential for seed corn maggot problems.

Objectives:
1. Establish 2 TAg teams for organic field corn producers with each producer having three corn fields scouted.
2. Compile data on each farm to share with the producer and look to compile those practices that could be shared with other organic producers.
3. Project Evaluation

Procedures:
Finding farms to actively participate in this IPM project became one the most difficult parts of this project. Of the seven farms contacted as possible participants in this project, two farms that grew corn in 2005 chose not to grow corn in 2006 and one farm opted not to participate. One of the barriers to completing this project was the view expressed by two of the seven farms contacted that they were reluctant to or chose not to as in one case participate in a project where a land grant would collect data and look to share that data in mass. Both producers expressed the desire to exchange information at their discretion among other organic corn producers but felt

that allowing Cornell representatives to study their production habits and report them would lead to organic corn production becoming a commodity and receiving a commodity price versus the value added price they feel they receive now. There was also an expression of feeling that Cornell Cooperative Extension was being reactive to the needs of organic producers and appearing trendy versus proactively and sincerely trying to help organic producers with their crop concerns.

This view of the project was enlightening given that one of the reasons this grant was sought was to help build a bridge to the organic community. One lesson learned was the need to build relationships and trust and the assumption that both were sufficient in this situation given the positive relations that were in existence with CCE and Cornell was just not the case.

Four farms did agree to participate and the second barrier to completing the objectives soon came to light. Producers were in some instances as much as 40 or more miles apart so gathering in a traditional TAg team fashion was abandoned and the focus was placed on observing organic pest management practices. Two of the farms had organic certified for both corn and milk production, one farm was transitioning his land and cows to organic certification and one farm was growing organic crops.

Three of the farms entered two fields in the project and one farm entered five fields. An effort was made to have farms choose fields with different crop histories or rotations. Three of the farms had corn after a sod and also corn after soybeans.

Scouting began for all corn insects, weeds and diseases the week the corn was planted if possible. Diseases were scouted for but none of any significance were found. Weeds in each field were identified and those of significance number were noted for plant height. An attempt was made to document the date cultivation or any other weed control method. When row cultivation was used the difference in height of weeds in the row and between the rows was noted.

Corn plant height and growth stage was recorded at each visit. Plant population was taken at about the 5 leaf stage (V5). An attempt was made to document possible plant loss due to tine weeding and cultivation but this proved difficult to monitor. Tine weeding was aggressive enough that attempts to use surveyor flags and ribbons tied to plants proved futile as they were either pulled out or off the plant or simply gone.

Results and discussion:

Corn planting dates varied from as early as May 15 to as late as June 20 and overall these dates seem to reflect two windows of opportunity to plant given the wet year. Planting in mid-June was also due to taking a first cutting and then planting.

Organic producers have indicated not looking to plant as early as conventional farms because they would rather plant under warmer soil temperatures so the corn will emerge faster. Growers producing corn conventionally in the same area planted corn as much as two weeks earlier. Conventional planter box treatments which have insecticides and fungicides can not be used by

organic producers so planting later may have some basis but is a practice that should be more fully explored by research.

White grubs were found in one corn field that had been sod for many years and were likely caused some injury or loss as the plant population was 22, 800. Insects such as white grubs, wireworm and sod webworm can be problematic in corn fields that are planted into long time hay fields that have had little or no rotation over many years. This may be a larger issue in the Central New York area as organic producers look to find sod/hay fields that have not had conventional fertilizers and herbicides and can be easily certified as organic. Organic producers may believe because they are practicing crop rotation they should have minimal insect pests but are unaware issues planting into sods.

Figure 1. Grubs feeding on corn roots

Generally plant populations ranged from 13,700 to 32,000 compared to the suggested 26-28,000 plants for grain production and the 28-32,000 plants for corn silage. Tine weeding had a negative effect on young plants either removing them completely or disturbing the plant's root system as it was becoming established. Plants that were injured quite often turned purple and appeared slow to recover when compared to uninjured neighbors. One field had its population reduced to 13,000 (Figure 2) and was subsequently disked up and planted to another crop.

Figure 2. Seedling corn plant severely twisted by tine weeding.

The exact reason for injury or lack of injury was not always clear. Fields that appeared to have the most injury also had more clods, which in some instances covered the corn. It is possible that with finer textured soils and tine weeders set aggressively or deeply that they are actually pulling clods up. Tine weeders are typically meant to have light action on the soil exposing newly germinated weeds and not reaching the seed itself with the tines because of the planting depth.

Because some type of tine weeder or spiked drag is commonly used to address small weeds in the row, research needs to be devoted to this negative effect. As was discussed in the Procedures section an attempt was made to try to measure the loss of plants due to weeding and cultivation but was made difficult by the weeding itself. The best method for determining the amount of injury may actually be to plant a predetermined amount of seed using a research-type corn planter capable of such a procedure or a very well calibrated conventional corn planter and then counting the surviving plants.

The need for tine weeding and cultivation to reduce weed pressure was certainly observed during this project with rotation from sod to corn also resulting in lower weed pressure in some fields. Figure 3 shows a field that was tine weeded and cultivated. The weed control shown here is typical as weeds in the row are set back by the tine weeding and those between rows controlled by the tine weeding enough that the cultivator can easily remove what remains. The weeds in the row will cause the most of the yield reduction so organic corn growers must be diligent in their early season weeding. The four growers participating in this project would have attempted to weed more often but rainy weather hampered their efforts. Weeding is a difficult practice to follow in particular for organic dairy farmers who grow corn because of the time demands.

The large foxtail and velvet leaf shown in Figure 3 were common escape species. Other problem annuals included wild mustard/radish and lambsquarters. The presence of wild mustard plants may surprise conventional corn growers transitioning to organic as these species are easily controlled by herbicides but start very early in the season and come on quite strongly.

Long term sod fields or fields that may be better described as fallow fields had less pressure from annual weeds although there were still annuals present. These fields, by best record, were probably 8-10 years in sod or longer. They did still have perennial weeds such as goldenrod, quackgrass, orchardgrass, milkweed and hedge bindweed. These weeds did not appear to provide much competition but they were present.

The organic corn producers express that they do not feel they need or desire to achieve the relatively clean fields that are possible with herbicides. Part of this is a philosophical desire for balance or give and take with their environment. They also feel that they are receiving a value added price for there corn so there is less need to achieve high yields as the higher value of their crop compensates for lower yield. Future study is needed to assess how the frequency and cost of weeding/cultivation, weed pressure, yield and crop value all interact to affect profitability. Yield checks were conducted at three of the farms and the hope is to develop cost of production information for these farms in the future.

Several other insect pests were found later in the season. Japanese beetles were found in two fields beginning July 19 and armyworm was found in three fields in early August. No significant injury was noted from these pests. Fields were scouted for corn rootworm beetles but no fields were found to be above threshold. The most beetles found were 5 in 15 plants found on September 11.

In summary the original objectives of having TAg teams for organic corn producers was not achieved as distance between farms, time commitment by farms and philosophical differences came into play. Although participating farms were interested to know what was going on in their fields most were weeding and cultivating as much as time allowed given other commitments on that particular farm.

This project has provided a valuable source of information for current cropping practices on local organic farms for extension to build on. One goal is to develop a frequently asked question handout for those who are looking to grow organic crops in the future. The second is to follow up with those who participated to see if cost of production data can be generated.

Three issues observed as part of this project deserve further study:

- Confirm that later corn planting achieves the perceived benefits
- Assess how early weeding injures corn plants and the effect that has on final stand and yield
- Look at the interaction of frequency and cost of weeding/cultivation, weed pressure, yield and crop value to determine the most cost effective weed control.

Acknowledgement
The author would like to Mark Schmidt, who scouted fields and collected the data, for his efforts in completing this project.

Project location(s):
Two participating farms were located in Herkimer County, one Montgomery and one in Otsego.